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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,613	10/23/2003	Christopher Douglas Moffatt	HAR62 014	5924

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EXAMINER

BENGHUZZI, MOHSIN M

ART UNIT

PAPER NUMBER

2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/690,613

Applicant(s)

MOFFATT ET AL.

Examiner

Mohsin (Ben) Benghuzzi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date January 22, 2004 / Mar. 28, 2005
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference signs mentioned in the description:

- a) The reference sign '406' is disclosed at line 18, paragraph 0026 of the specification, however, it is indicated as '400' in Figure 4. The reference sign '400' in Figure 4 must be changed to '406.'
- b) The reference sign '702b' is disclosed at line 5, paragraph 0030 of the specification, however, it is not included in Figure 7 as claimed.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Independent claims 8 and 11 are objected to because they contain the acronym 'PAPR,' which was not defined (i.e., completely spelled out) in the claim. Any not commonly known acronyms used in an independent claim must first be defined. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Weerackody (US Pub 2002/0150036).

1) Regarding claim 8:

Weerackody teaches, in a multi-carrier communication system for transmitting data, a method for forming a data signal that reduces the required power of a transmitter comprising the steps of:

(a) providing the data to be transmitted in one or more unique sequences (paragraph 0005 lines 2-5, wherein, 'a phase sequence is employed having "V" random phase values' is interpreted as sequencing a data signal, also, paragraph 0012);

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(b) modulating the one or more unique sequences thereby creating one or more unique modulated sequences (paragraph 0005, wherein, 'OFDM' is interpreted as the modulation method);

(c) selecting for transmission one of the one or more unique modulated sequences based on the PAPR of the unique modulated sequences (paragraph 0006 lines 4-14);
and,

(d) reducing amplitudes of the selected one which are outside a predetermined range to thereby form a data signal that reduces power required to transmit the signal (paragraph 0002 lines 11-13).

2) Regarding claim 9:

Weerackody teaches the method according to claim 8, wherein the step of reducing amplitudes includes the step of comparing samples of the selected one to a threshold and reducing the amplitude of samples exceeding the threshold (paragraph 0002 lines 11-13, wherein, 'above a prescribed threshold level' is interpreted as indicating comparing of samples to a threshold).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-7 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weerackody (US Pub 2002/0150036) in view of Corral (US Pub 2004/0086054).

1) Regarding claim 1:

Weerackody teaches a method for reducing the peak-to-average power ratio of a communication signal comprising the steps of:

(a) sequencing a data signal according to a data vector to thereby create a sequenced data signal (paragraph 0005 lines 2-5, wherein, 'a phase sequence is employed having "V" random phase values' is interpreted as sequencing the data, also, paragraph 0012, wherein, equation 1 is interpreted as the data vector);

(b) modulating a first plurality of carrier waves at a second plurality of frequencies with said sequenced data signal to thereby create a modulated signal (paragraph 0005, wherein, 'OFDM' is interpreted as the modulation method);

(c) measuring the peak-to-average power ratio of the modulated signal (paragraph 0006 lines 3-4, wherein, 'a representation of the PAPR value' is interpreted to indicate measuring the peak-to-average);

(d) comparing said power ratio with a predetermined threshold (paragraph 0006 lines 4-8);

(e) if said power ratio exceeds said predetermined threshold, sequencing said data signal according to a data vector different from previous data vectors to thereby create a sequenced data signal different from previous sequenced data signals and repeating steps (b)-(e) until said power ratio does not exceed said predetermined threshold

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(paragraph 0006 lines 7-14, wherein, 'using different random phase values' is interpreted as according to a data vector different from previous data vectors);

(g) sampling said appended signal (paragraph 0018 lines 2-4);

(h) reducing amplitude of said samples which exceed a predetermined range to thereby create a reduced amplitude signal (paragraph 0002 lines 11-13).

Weerackody does not teach, if said power ratio does not exceed said predetermined threshold, appending to the modulated signal a data map signal associated with the data vector for which said power ratio does not exceed said predetermined threshold to thereby create an appended signal. However, Corral teaches, if said power ratio does not exceed said predetermined threshold, appending to the modulated signal a data map signal associated with the data vector for which said power ratio does not exceed said predetermined threshold to thereby create an appended signal (paragraph 0031 lines 3-6, wherein, 'a pointer to the multiplying sequence can be transmitted as "side information"' is interpreted as appending to the modulated signal a data map signal).

It is essential that a data map signal associated with the data vector is transmitted along with the modulated signal. This conveys to the receiver which sequence was selected by the transmitter for transmission, and thus, enables the receiver to recover the transmitted data (see Corral paragraph 0031, lines 3-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to append the modulated signal of Weerackody with a data map

signal associated with the data vector, as Corral teaches, in order for the receiver to be able to recover the transmitted data.

Corral further teaches, filtering said reduced amplitude signal to thereby create said communication signal with a reduced peak-to-average power ratio (paragraph 0024 lines 5-10). Filtering after amplitude clipping is essential in that it band limits spectral spreading (see Corral paragraph 0024 lines 9-10).

2) Regarding claim 2:

Corral does not specifically teach, further comprising the step of reducing amplitude of samples adjacent to the samples exceeding the threshold, however, it should be obvious to one of ordinary skill in the relevant art that the method of reducing a sample amplitude exceeding a threshold may also be applied to reducing an adjacent sample amplitude. The advantages to reducing an adjacent sample amplitude are also similar to those for reducing the main sample amplitude, i.e., further PAPR reduction. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the reduction of adjacent sample amplitudes in the method of Corral.

3) Regarding claim 3:

Weerackody teaches, in a multi-carrier communication system, a method of transmitting data comprising the steps of:

(a) sequencing the data according to one or more unique sequences (paragraph 0005 lines 2-5, wherein, 'a phase sequence is employed having "V" random phase values' is interpreted as sequencing the data, also, paragraph 0012);

- (b) modulating one or more of the unique sequences of data (paragraph 0005, wherein, 'OFDM' is interpreted as the modulation method);
- (c) selecting one of the modulated sequences of data based on the PAPR of that sequence (paragraph 0006 lines 1-14);
- (e) transmitting the filtered signal over the multi carrier communication system (paragraph 0006 lines 4-6 and lines 12-14, wherein, "OFDM" is clearly interpreted as the multi carrier communication system).

Furthermore, Corral, as discussed in claim 1 above, teaches, filtering said selected one to remove amplitude peaks outside a threshold band to thereby create a filtered signal (paragraph 0024 lines 5-10).

4) Regarding claim 4:

Weerackody teaches the method according to claim 3, wherein the step of filtering includes the step of comparing samples of the selected one to a threshold and reducing the amplitude of samples exceeding the threshold (paragraph 0002 lines 11-13).

5) Regarding claim 5:

As discussed in claim 2 above, Corral does not specifically teach, further comprising the step of reducing the amplitude of samples adjacent to the samples exceeding the threshold, however, it should be obvious to one of ordinary skill in the relevant art that the method of reducing a sample amplitude exceeding a threshold may also be applied to reducing an adjacent sample amplitude.

6) Regarding claim 6:

Weerackody teaches, in a multi-carrier communication system with a linear amplifier, a method of preventing limiting of the amplifier comprising the steps of:

- (a) sequencing data to be transmitted based upon a resultant PAPR of the modulated sequence (paragraph 0005 lines 2-5, wherein, 'a phase sequence is employed having "V" random phase values' is interpreted as sequencing data, paragraph 0012, and paragraph 0006 lines 4-6, lines 12-14);
- (b) modulating the sequenced data (paragraph 0005, wherein, 'OFDM' is interpreted as the modulation method);
- (c) sampling the modulated sequenced data (paragraph 0018 lines 2-4);
- (d) reducing the amplitude of samples which are outside a predetermined threshold (paragraph 0002 lines 11-13); and,
- (e) transmitting the resultant signal with a reduced PAPR to thereby prevent limiting of the amplifier (paragraph 0006 lines 4-6 and lines 12-14).

In (e), Weerackody does not specifically teach, thereby prevent limiting of the amplifier, however, Corral does teach, thereby prevent limiting of the amplifier (paragraph 0024 lines 1-7, wherein, overdriving of amplifier is interpreted as limiting of amplifier). It is well known in the art that limiting of a linear amplifier be prevented before signal transmission. Reducing PAPR prevents limiting of an amplifier. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the PAPR reduction of Weerackody is performed before transmission in order to prevent limiting of the amplifier.

7) Regarding claim 7:

As discussed in claim 2 above, Corral does not specifically teach, further comprising the step of reducing the amplitude of samples adjacent to the samples outside a predetermined threshold, however, it should be obvious to one of ordinary skill in the relevant art that the method of reducing the amplitude of samples which are outside a predetermined threshold may also be applied to reducing the amplitude of adjacent samples.

8) Regarding claim 10:

As discussed in claim 2 above, Corral does not specifically teach, further comprising the step of reducing the amplitude of samples adjacent to the samples exceeding the threshold, however, it should be obvious to one of ordinary skill in the relevant art that the method of reducing a sample amplitude exceeding a threshold may also be applied to reducing an adjacent sample amplitude.

9) Regarding claim 11:

Weerackody discloses, in a multi-carrier communication system, a transmitter for transmitting data with multiple carriers comprising:
a modulator for modulating multi-carrier symbols with the data (paragraph 0005, wherein, 'OFDM' is interpreted as generated by the modulator, also, paragraph 0028 lines 1-3, wherein, unit '105' is the modulator);
a processor for measuring the PAPR of the modulated data (paragraph 0006 lines 14-17, wherein, the 'computation process' is interpreted to be performed by the processor);
a processor for re-sequencing the data (303 in Fig. 3 and paragraph 0026 lines 4-8).

Weerackody does not specifically disclose, a logic device for comparing the PAPR with a predetermined threshold, however, it is well known in the relevant art that comparison of two values is performed using a logic device. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have Weerackody's comparison of the PAPR with a predetermined threshold (see paragraph 0006 lines 4-14) performed using a logic device.

Furthermore, as discussed in claim 1 above, Corral discloses, an amplitude filter for reducing peaks of the modulated data signal that are outside a predetermined range (paragraph 0024 lines 5-10).

10)Regarding claim 12:

Weerackody does not specifically disclose, wherein the amplitude filter is a FIR filter, FIR filters are well known in the relevant art, and therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the amplitude filter for reducing peaks to be a FIR filter.

11)Regarding claim 13:

Weerackody does not specifically disclose, wherein the amplitude filter is an IIR filter, IIR filters are well known in the relevant art, and therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the amplitude filter for reducing peaks to be an IIR filter.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wang et al. (US Pub 2002/0168016) discloses a method and apparatus for reducing PAPR in a multi-carrier modulation system.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohsin (Ben) Benghuzzi whose telephone number is (571) 270-1075. The examiner can normally be reached Monday through Friday, 8:30am- 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Mohsin (Ben) Benghuzzi

February 26, 2007


MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER